

## **PGEW Series of Single- and Multi-epi 905 nm Pulsed Semiconductor Lasers** **Low-Cost High-Power Laser-Diode Family**



*The PGEW Series is ideal for commercial range finding applications.*

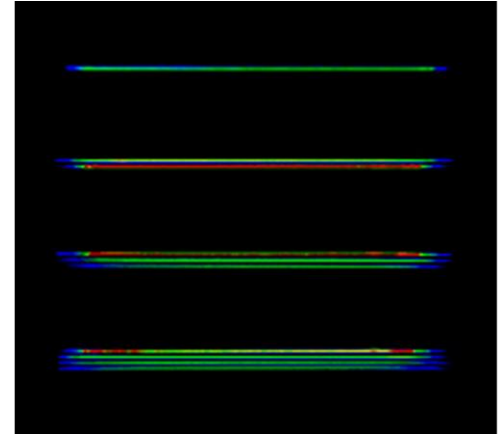
Excelitas Technologies' PGEW Series of single- and multi-epi 905 nm pulsed semiconductor lasers consists of a series of devices having up to four active lasing layers epitaxially grown on a single GaAs substrate chip. This multi-layer design multiplies the output power by the number of epi-layers. For example, the QPGEW quad laser at 225  $\mu\text{m}$  active layer width, which has four epitaxially grown lasing layers, delivers an output peak power close to 100 W.

The T1  $\frac{3}{4}$  (TO-like) plastic encapsulated package complements Excelitas' epi-cavity lasers in hermetic metal packages and are ideally suited for high volume applications. The lasers employ Excelitas' novel multi-active area laser chips to deliver high output power in a small emitting area.

The laser chips of the PGEW family feature stripe widths of 75 and 225  $\mu\text{m}$  and come as single (PGEW), double (DPGEW), triple (TPGEW), or quadruple (QPGEW) epi-cavity version. These devices possess a 25° beam divergence in the direction perpendicular to chip surface and a 10° beam spread within the junction plane. The power output shows an excellent stability over the full MIL specification temperature range. Structures are fabricated using metal organic chemical vapour deposition (MOCVD).

Where fiber coupling applications are concerned, the transverse spacing of the epi-cavity active area concentrates more optical power into a smaller geometry allowing for increased optical power coupling into optical fibers.

Peak wavelength is centered near the maximum responsivity of most silicon photodiodes. The PGEW lasers match especially well with devices from the Excelitas epi-APD family C30737. The devices are ideally suited for applications where cost is a primary concern and high volume production capacity is required.



*Intensity of light is shown from single-cavity, dual-cavity, triple-cavity and quad-cavity lasers.*

### **Key Features**

- Doubling, tripling or quadrupling of the output power from a single epi-cavity chip with a small active area
- Peak power over 100 W at 20 ns pulse width
- High reliability
- Small emitting areas increase fiber coupled output
- Lower cost plastic packaging for high volume
- RoHS compliant

### **Applications**

- Laser range finding
- Laser-based speed enforcement
- IR-illumination
- Laser skin therapy

**Table 1: PGEW Pulsed Laser Family Selection Guide**

| Device     | Description                           | Total # of emitting stripes | Typical peak power  |  |
|------------|---------------------------------------|-----------------------------|---|--|
|            |                                       |                             | at $i_{FM}$ , 100 ns, 10A<br>3 mils (75 $\mu$ m) stripe width | at $i_{FM}$ , 100 ns, 30A<br>9 mils (225 $\mu$ m) stripe width |
| PGEW1SXXH  | Single chip laser – Single epi-cavity | 1                           | 6.5 W   | 23 W   |
| DPGEW1SXXH | Single chip laser – Double epi-cavity | 2                           | 13 W  | 45 W   |
| TPGEW1SXXH | Single chip laser – Triple epi-cavity | 3                           | 20 W  | 70 W   |
| QPGEW1SXXH | Single chip laser – Quad epi-cavity   | 4                           | 25 W  | 85 W   |

**Table 2: Maximum Ratings**

| Parameter                            | Symbol   | Min | Max  | Units        |
|--------------------------------------|----------|-----|------|--------------|
| Peak reverse voltage                 | $V_{RM}$ |     | 2    | V            |
| Pulse duration                       | $t_w$    |     | 100  | ns           |
| Duty factor                          | $du$     |     | 0.1  | %            |
| Storage temperature                  | $T_S$    | -55 | 105  | $^{\circ}$ C |
| Operating temperature                | $T_{OP}$ | -55 | 85   | $^{\circ}$ C |
| Soldering for 5 seconds (leads only) |          |     | +260 | $^{\circ}$ C |

**Table 3: Generic Electro Optical Specifications at 23 $^{\circ}$ C**

| Parameter  | Symbol                   | Min | Typ  | Max | Units            |
|--|--------------------------|-----|------|-----|------------------|
| Center wavelength of spectral envelope                           | $\lambda_c$              | 895 | 905  | 915 | nm               |
| Spectral bandwidth at 50% intensity points                       | $\Delta\lambda$          |     | 5    |     | nm               |
| Wavelength temperature coefficient                               | $\Delta\lambda/\Delta T$ |     | 0.25 |     | nm/ $^{\circ}$ C |
| Beam spread (50% peak intensity) parallel to junction plane      | $\Theta_{  }$            |     | 10   |     | degrees          |
| Beam spread (50% peak intensity) perpendicular to junction plane | $\Theta_{\perp}$         |     | 25   |     | degrees          |

**Table 4: 75 $\mu$ m Stripe Width Family: Operating Characteristics at  $T_{OP}=23^{\circ}$ C,  $i_{FM}=10$ A,  $t_w=100$ ns,  $prf=1$ kHz**

| Parameter  |            | PGEW1S03H | DPGEW1S03H | TPGEW1S03H | QPGEW1S03H <sup>1</sup> | Units    |
|--|------------|-----------|------------|------------|-------------------------|----------|
| Minimum Optical Power at $i_{FM}$                | $P_{Omin}$ | 6         | 12         | 18         | 22.5                    | W        |
| Typical Optical Power at $i_{FM}$                | $P_{Otyp}$ | 6.5       | 13         | 20         | 25                      | W        |
| # of Emitting stripes                            | -          | 1         | 2          | 3          | 4                       |          |
| Emitting area                                    |            | 75 X 1    | 75 X 5     | 75 X 10    | 75 X 15                 | $\mu$ m  |
| Maximum Peak forward Current                     | $i_{FM}$   | 10        | 10         | 10         | 10                      | A        |
| Typical lasing threshold current                 | $i_{TH}$   | 0.5       | 0.75       | 0.75       | 0.75                    | A        |
| Typical Forward voltage at $i_{FM}$ <sup>2</sup> | $V_F$      | 2.4       | 6.4        | 10.6       | 14.7                    | V        |
| Typical Series Resistance                        | R          | 0.10      | 0.23       | 0.41       | 0.52                    | $\Omega$ |
| Typical Bandgap Voltage Drop                     | $V_g$      | 1.4       | 4.1        | 6.5        | 9.5                     | V        |

1. Operating pulse width for the QPGEW1S03H is 50ns
2. Excluding the voltage drop contribution due to the inductive element of the package, as estimated by  $V_F = R_S i_F + V_g$ .

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**Table 5: 225µm Stripe Width Family: Operating Characteristics at T<sub>OP</sub>=23°C, i<sub>FM</sub>=30A, t<sub>W</sub>=100ns, prr =1kHz**

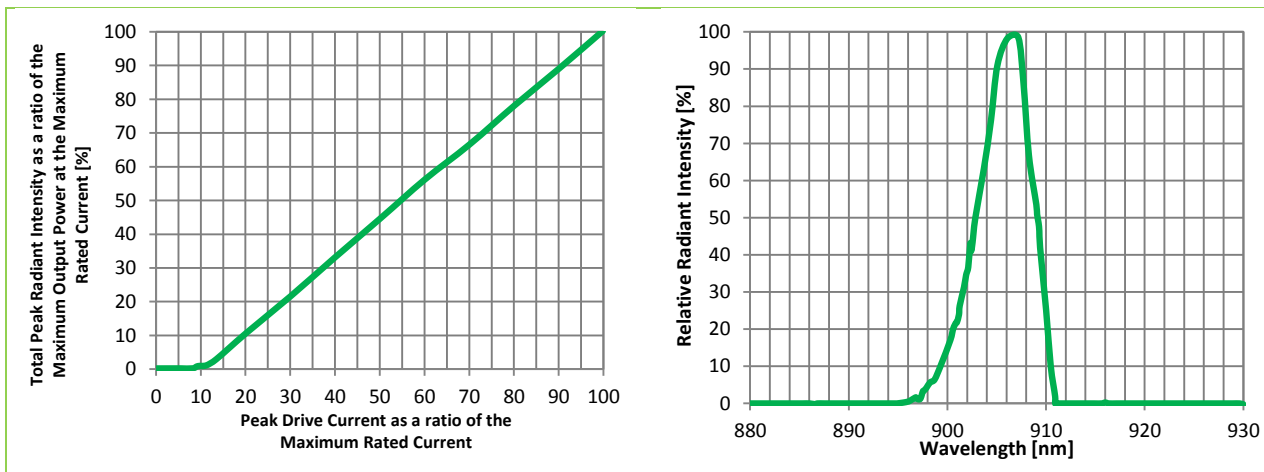
| Parameter   |                   | PGEW1S09H | DPGEW1S09H | TPGEW1S09H | QPGEW1S09H <sup>3</sup> | Units |
|---|-------------------|-----------|------------|------------|-------------------------|-------|
| Minimum Optical Power at i <sub>FM</sub>                | P <sub>Omin</sub> | 21        | 42         | 65         | 78                      | W     |
| Typical Optical Power at i <sub>FM</sub>                | P <sub>Otyp</sub> | 23        | 45         | 70         | 85                      | W     |
| # of Emitting stripes                                   | -                 | 1         | 2          | 3          | 4                       |       |
| Emitting area   |                   | 225 X 1   | 225 X 5    | 225 X 10   | 225 X 15                | µm    |
| Maximum Peak forward Current                            | i <sub>FM</sub>   | 30        | 30         | 30         | 30                      | A     |
| Typical lasing threshold current                        | i <sub>TH</sub>   | 1.5       | 1.75       | 1.75       | 1.75                    | A     |
| Typical Forward voltage at i <sub>FM</sub> <sup>4</sup> | V <sub>F</sub>    | 3.2       | 8          | 12.8       | 17.3                    | V     |
| Typical Series Resistance                               | R <sub>S</sub>    | 0.06      | 0.13       | 0.21       | 0.26                    | Ω     |
| Typical Bandgap Voltage Drop                            | V <sub>g</sub>    | 1.4       | 4.1        | 6.5        | 9.5                     | V     |

- Operating pulse width for the QPGEW1S03H is 50ns
- Excluding the voltage drop contribution due to the inductive element of the package, as estimated by  $V_F = R_S i_F + V_g$ .

**Ordering Guide**

|                                     | X | P | G | A | X | X | S | XX | H |
|-------------------------------------|---|---|---|---|---|---|---|----|---|
| Double active area                  | D |   |   |   |   |   |   |    |   |
| Triple active area                  | T |   |   |   |   |   |   |    |   |
| Quadruple active area               | Q |   |   |   |   |   |   |    |   |
| Pulsed                              |   | P |   |   |   |   |   |    |   |
| 905 nm nominal centre wavelength    |   |   | G |   |   |   |   |    |   |
| ± 10 nm centre wavelength tolerance |   |   |   | E |   |   |   |    |   |
| Plastic T1 ¼W package               |   |   |   |   | W |   |   |    |   |
| Single chip stack                   |   |   |   |   |   | 1 |   |    |   |
| Stackable chip                      |   |   |   |   |   |   | S |    |   |
| 0.003" wide laser stripe (75 µm)    |   |   |   |   |   |   |   | 03 |   |
| 0.009" wide laser stripe (225 µm)   |   |   |   |   |   |   |   | 09 |   |
| RoHS compliance                     |   |   |   |   |   |   |   |    | H |

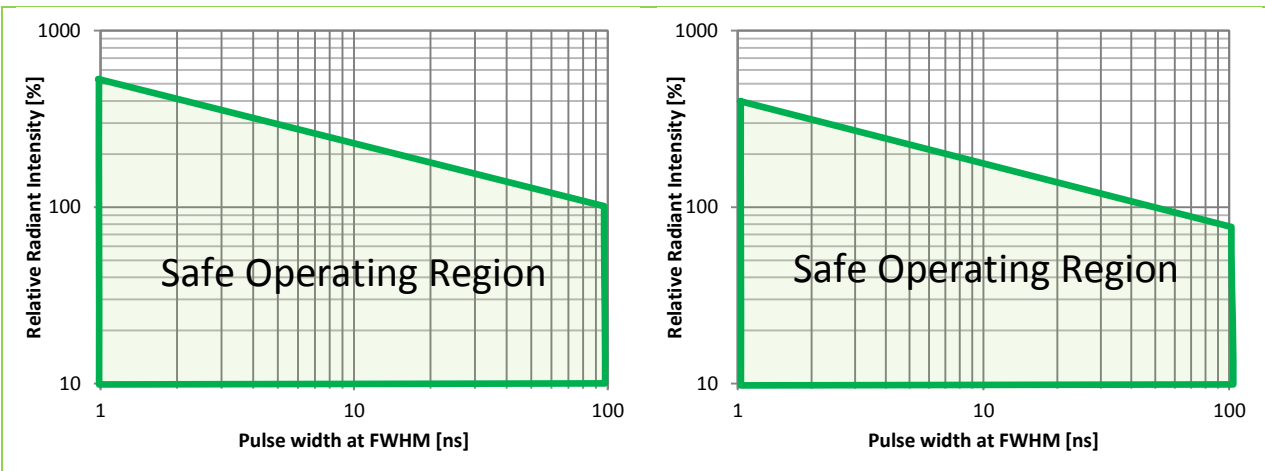
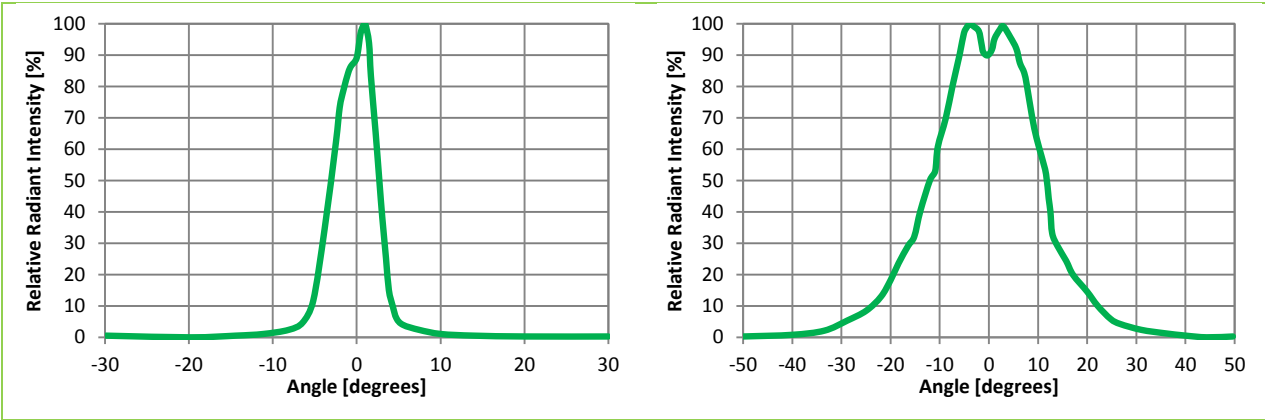
**Electro-Optical Characteristics**



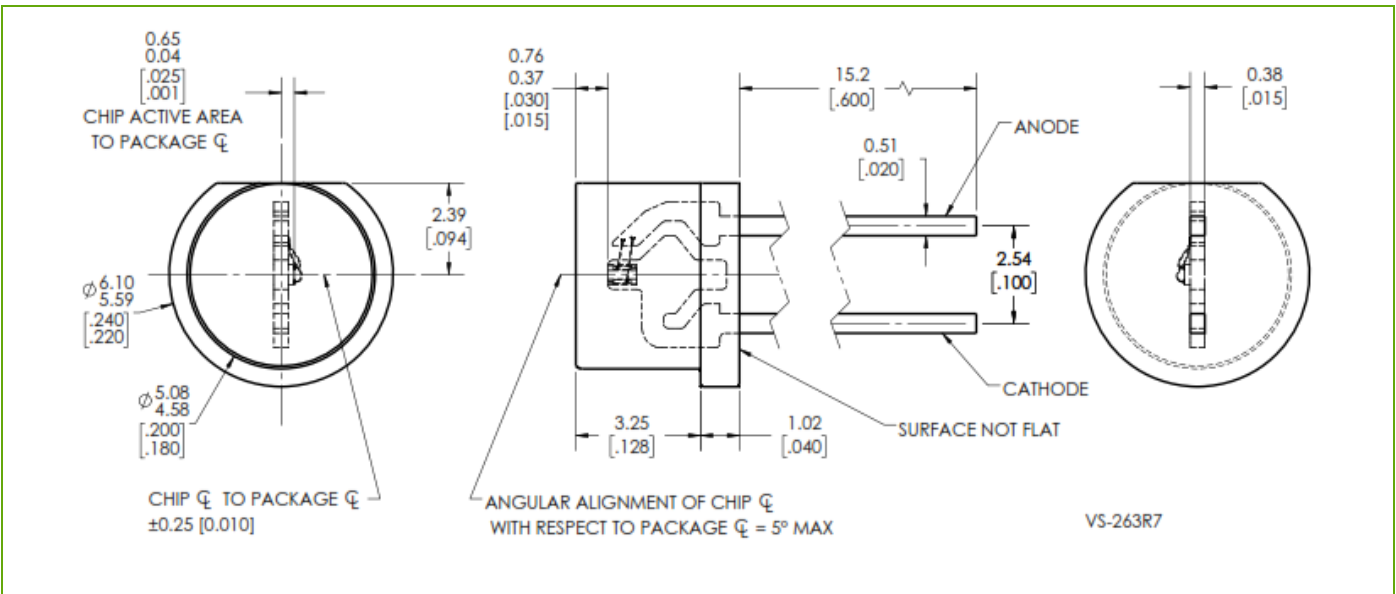
**Figure 1**

- LEFT:**  
Total Peak Radiant Intensity vs. Peak drive Current
- RIGHT:**  
Spectral Distribution Plot

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**Low-Cost High-Power Laser-Diode Family for Commercial Range Finding**



**Figure 4: Package Drawings (W package)**



Dimensions are in mm [inches], are for reference only and subject to change without notice.

## PGEW Series of Single-epi and Multi-epi 905 nm Pulsed Semiconductor Lasers

### Low-Cost High-Power Laser-Diode Family for Commercial Range Finding

#### Operating Conditions

The laser is operated by pulsing current in the forward bias direction.

The Excelitas warranty applies only to devices operated within the maximum rating, as specified. Exceeding these conditions is likely to cause permanent “burn off” damage to the laser facet and consequently a significant reduction in optical power. Operating the devices at increased duty cycles will ultimately and irreparably damage the crystal structure due to internal heating effects.

Diodes are static sensitive and suitable precautions should be taken when removing the units from their antistatic containers. Circuits should be designed to protect the diodes from high current and reverse voltage transients. Voltages exceeding the reverse breakdown of the semiconductor junction are particularly damaging and have been shown to cause degradation of power output.

Although the devices will continue to perform well at elevated temperatures for some thousands of hours, defect mechanisms are accelerated. Optimum long term reliability will be attained with the semiconductor at or below room temperature.

Adequate heat sinking should be employed when operated at maximum duty factor.

#### For Your Safety

Laser Radiation:

Under operation, these devices produce invisible electromagnetic radiation that may be harmful to the human eye. To ensure that these laser components meet the requirements of Class IIIb laser products, they must not be operated outside their maximum ratings. Power supplies used with these components must be such that the maximum peak forward current cannot be exceeded. It is the responsibility of the user incorporating a laser into a system to certify the Class of use and ensure that it meets the requirements of the ANSI or appropriate authority.

Further details can be obtained in the following publications:

**21CFR 1040.10** – “Performance Standards for Light Emitting Products (Laser Products)”

**ANSI Z136.1** – “American National Standard for Safe Use of lasers”

**IEC 60825-1** – “Safety of Laser Products”

#### RoHS Compliance

This series of laser diodes are designed and built to be fully compliant with the European Union Directive 2011/65/EU – Restriction of the use of certain Hazardous Substances (RoHS) in Electrical and Electronic equipment.



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### Warranty

A standard 12-month warranty following shipment applies. Any warranty is null and void if the package window has been opened.

### About Excelitas Technologies

Excelitas Technologies is a global technology leader focused on delivering innovative, customized solutions to meet the lighting, detection and other high-performance technology needs of OEM customers.

Excelitas has a long and rich history of serving our OEM customer base with optoelectronic sensors and modules for more than 45 years beginning with PerkinElmer, EG&G, and RCA. The constant throughout has been our innovation and commitment to delivering the highest quality solutions to our customers worldwide.

From aerospace and defense to analytical instrumentation, clinical diagnostics, medical, industrial, and safety and security applications, Excelitas Technologies is committed to enabling our customers' success in their specialty end-markets. Excelitas Technologies has approximately 5,000 employees in North America, Europe and Asia, serving customers across the world.

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